

ABSTRACT OF THE DISCLOSURE**OPTICAL THRESHOLD AND COMPARISON DEVICES AND METHODS**

- 5 An optical device for providing threshold and comparison functions. The device comprises first and second SOA's having respective first and second propagation paths along which the first and second optical signals, input as signals $P_{in1}(\lambda_1)$ and $P_{in2}(\lambda_2)$, travel in first and second forward directions. A feedback path is provided using couplers to interconnect the outputs of the SOA's. As a result, a portion of the
- 10 optical signals output from each SOA is supplied backwards into the output of the other SOA as feedback optical control signals $P_{feedback1}(\lambda_1)$ and $P_{feedback2}(\lambda_2)$. The feedback optical control signals modulate the gain of the forwards travelling optical signals by cross gain modulation (XGM). In contrast to prior art devices, the optical control signal is supplied backwards into the SOA's in a counter-propagating
- 15 configuration. This allows much shorter feedback path lengths to be achieved in comparison to what is possible with prior art co-propagating configurations. Consequently, much higher bit rates can be achieved. The device may also be implemented in planar waveguide technology.